Geoscientific
Model Development
Discussions

Interactive comment on "Using a single column model (SGRIST1.0) for connecting model physics and dynamics in the Global-to-Regional Integrated forecast SysTem (GRIST-A20.8)" *by* Xiaohan Li et al.

Anonymous Referee #1

The aim of the manuscript is to demonstrate the benefits of having a SCM version of a global model to be able to test new parameterization in a more simplified environment than the full 3-D model. In the work of implementing a new parameterization suite, it is useful to be able to do technical tests in such a framework and the description of the workflow can be useful information to have documented. However, as the manuscript is written it is not clear that this is the main purpose of the paper as there are some discussion on results simulation results as well. It is very few testcases, three cloud cases and one idealized tropical storm. The cases and the discussion of the results

is not very insightful and does not add to the scientific literature. Thus, I am quite puzzled with the purpose of the paper. Maybe it is worth publishing if the authors concentrate the storyline on the workflow and describe the choices and purpose of the testcases in a more general way. But as it is presented now, it is not sufficient on the methodology and the discussion of the results does not show insight to the processes that are studied and therefore I recommend reject.

Specific comments:

Abstract, Line 21: "... of the simulated storm." What storm? Why? Line 45: "An AGCM coupled with a full physical ...". It is very unclear what it means that an AGCM can be evaluated using aqua planet experiments. Do you mean numerically or what? All AGCMs need parameterisations of physics. Line 50: "APE runs are usually evaluated by qualitative analysis" – what other ways are you suggesting since you use the word usually? Line 53: You are using the term "model error" in an unprecise way. There are several layers of model errors and several methods needs to be used to assure that the model is useful, it is not only dynamics and physics and their interaction that introduces errors. Line 87: What is meant by a validated paramterization suite? That they technically work together? That they represent all physics? Line 122: This a very limited type of SCM where only part of the parameterization suite can be tested as you are not carrying any equations for momentum. The performance of the PBL scheme cannot be examined. What about the interaction with the surface? It is also quite strange that you put the subscript "obs" in the equations. Is it really observations you are relaxing to? Where do you get the large-scale terms from? What is the relaxation time scale? Line 141: Here is it stated that the vertical velocity comes from observational data, so called IOP data. Is that really the case? Line 155: If you are not using prognostic aerosols, what are you doing? Neglecting or using prescribed values? Line 161: How were the three cases selected and why? Line 168: Is not standard SCAM using 31 levels? This is thus purely technical test (or possibly numerical on the time-step integration and relaxation) of the SGRIST as it is the same as in SCAM, or what am I missing?

Line 192: If you see a deficiency in the midlevel humidity, would that not come from the large-scale fields, that you are relaxing to, and not the parameterisations? What parameterization would create that? Line 240: The conclusion that cloud variables are sensitive to the thermodynamical environment is trivial. Line 246: What exactly have you verified? That the code import was successful? Line 258: Dribbling strategy is not clear and the reference to se_ftype0 does not make sense. Line 263: "Evolution of the storm highly resembles the weather process …" This sentence gives a very strange impression, not sure what you mean, maybe reveals what your expectations of what a model is intended to do, or? Line 268: How do you motivate a time step for the physics to be longer than the dynamics? Line 269: Why do you have one figure in supplement? Line 270: Why do you repeat the time steps here as you have them in the table? Line 282: I would not like to have any conspicuous behavior in a model (at least not some that I know about!). Line 287: Normally one would expect a relationship between time step and model resolution, thus not all your combinations are worth testing and it is no surprise that they fail. However, one can possibly learn from the model if investigating why and where instabilities arise. Have you looked into that? Line 288: "This is consistent… "What is consistent and why? Line 309-end: I do not think the concluding statements really contributes to any general understanding and they are not new. They are formulated for a specific model system and that limits even more the interest for them. Line 420: What do you mean by the sentence starting with "A way …"?